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EXAMINER	
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Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No. 10/054,581	Applicant(s) ROCKWELL ET AL.
	Examiner Christina Y. Leung	Art Unit 2633

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 22 January 2002.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1-25 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) 1-25 is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on 22 January 2002 is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date 1-22-02.

4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the second paragraph of 35 U.S.C. 112:

> The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

2. Claim 24 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 24 recites the limitation "wherein synchronizing comprises delaying the clock signal" in lines 1-2 of the claim. There is insufficient antecedent basis for this limitation in the claim because claim 22 on which it depends does not previously recite synchronizing or a clock signal. Examiner respectfully suggests that Applicants may amend claim 24 to depend on claim 23 instead.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

4. Claims 1-6, 8, 13, 22, and 25 are rejected under 35 U.S.C. 102(b) as being anticipated by Arthurs et al. (US 4,873,681 A).

Regarding claim 1, Arthurs et al. disclose a router circuit (Figure 3) having a plurality of electrical input signals (labeled "data streams" in Figure 3) comprising:

an electrical-to-optical converter (transmitters 45-1...N) for changing the plurality of electrical input signals into a plurality of optical input signals;

a mixing circuit (N x N star coupler 22) coupled to the electrical-to-optical converter, the mixing circuit generating a plurality of substantially identical composite signals corresponding to the plurality of optical inputs, the composite signals comprising at least a portion of each of the plurality of optical signals;

a plurality of optical bandpass filters (part of fixed wavelength receivers 61-1...N) coupled, respectively, to each one of the plurality of composite signals, the plurality of bandpass filters passing a portion of the optical signal to form a plurality of filtered signals (although Arthurs et al. do not explicitly illustrate the bandpass filters in Figure 3, they disclose that the receivers 61-1...N may comprise them; see column 5, lines 23-25); and

an optical-to-electrical converter circuit (fixed wavelength receivers 61-1...N) coupled to the plurality of bandpass filters, the optical-to-electrical converter converting the plurality of filtered optical signals into a plurality of respective electrical output signals (column 4, lines 4-19).

Regarding claim 2, Arthurs et al. disclose that the plurality of bandpass filters comprises a respective plurality of center wavelengths (column 4, lines 4-19 and column 5, lines 23-25).

Regarding claim 3, Arthurs et al. disclose a control circuit (including control logic 53-N and other circuitry shown in Figure 2) coupled to the electrical-to-optical converter (transmitters 45-1...N), wherein the electrical-to-optical converter comprises a plurality of electrical-to-optical converters, the control circuit selecting a respective plurality of electrical-to-optical converter wavelengths in response to the plurality of bandpass center wavelengths (column 3, lines 40-43).

Regarding claim 4, Arthurs et al. disclose that the plurality of wavelengths of the electrical-to-optical converter is tunable (column 3, lines 34-36; column 4, lines 4-6).

Regarding claim 6, Arthurs et al. disclose that the electrical-to-optical converter comprises a plurality of electrical-to-optical converters (i.e., a plurality of transmitters 45-1...N as shown in Figure 3).

Regarding claim 8, Arthurs et al. disclose that the electrical-to-optical converter comprises a modulated tunable laser having a programmed wavelength (column 3, lines 54-59).

Regarding claim 13, Arthurs et al. disclose that the mixing circuit comprises a passive star power splitter (element 22 in Figure 3; column 4, lines 4-14).

Regarding claim 5, Arthurs et al. does not disclose that the bandpass filters in the router circuit shown in Figure 3 are specifically tunable, but Arthurs et al. disclose a different router circuit having a plurality of electrical input signals in Figure 4 (not Figure 3) comprising:

an electrical-to-optical converter (transmitters 67-1..N) for changing the plurality of electrical input signals into a plurality of optical input signals;

a mixing circuit (N x N star coupler 32) coupled to the electrical-to-optical converter, the mixing circuit generating a plurality of substantially identical composite signals corresponding to the plurality of optical inputs, the composite signals comprising at least a portion of each of the plurality of optical signals (column 4, lines 39-49);

a plurality of optical bandpass filters (part of tunable receivers 51-1...N) coupled, respectively, to each one of the plurality of composite signals, the plurality of bandpass filters passing a portion of the optical signal to form a plurality of filtered signals, and

an optical-to-electrical converter circuit (tunable receivers 51-1...N) coupled to the plurality of bandpass filters, the optical-to-electrical converter converting the plurality of filtered optical signals into a plurality of respective electrical output signals.

Arthurs et al. further disclose, with regard to the router circuit of Figure 4, that the plurality of bandpass filters comprises a respective plurality of center wavelengths and wherein the plurality of center wavelengths of the plurality of bandpass filters is tunable (column 4, lines 49-60).

Regarding claim 22, Arthurs et al. disclose a method of operating a routing circuit (Figure 3) comprising:

converting a plurality of electrical signals to a respective plurality of modulated optical signals (using transmitters 45-1...N);

coupling the plurality of modulated optical signals to a cross connect switch (star coupler 22);

forming a plurality of composite signals at a plurality of outputs of the cross-connect switch, the plurality of composite signals composed of the modulated optical signals (using star coupler 22; column 4, lines 4-14);

converting each of the composite signals into an electrical output signal corresponding to a portion of the modulated optical signals (using fixed wavelength receivers 61-1...N; column 4, lines 15-19).

Regarding claim 25, Arthurs et al. disclose that converting a plurality of electrical signals to a respective plurality of modulated optical signals comprises modulating a respective plurality of diode lasers, each of which is tuned to the center wavelength of a bandpass filter (column 3,

lines 34-43). Again, although Arthurs et al. do not explicitly illustrate the bandpass filters in Figure 3, they disclose that the receivers 61-1...N may comprise them; see column 5, lines 23-25.

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. Claim 12 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs et al.

Regarding claim 12, Arthurs et al. disclose a system as discussed above with claim 1, including an optical-to-electrical converter (receivers 61-1...N shown in Figure 3). They do not further specifically disclose that the optical-to-electrical converter comprises a photodiode, but photodiodes are well known in the art as commonly available devices for converting optical signals to electrical ones. It would have been obvious to a person of ordinary skill in the art to use photodiodes as the optical-to-electrical converter in the system disclosed by Arthurs et al. simply in order to implement the disclosed conversion using widely known and available elements.

7. Claims 7, 16, 17, 20, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs et al. in view of Kogelnik et al. (US 4,787,693 A).

Regarding claim 7, Arthurs et al. disclose a system as discussed above with regard to claim 1, including a mixing circuit (also known as a star coupler), but they do not specifically disclose a first plurality of mixers coupled with a second plurality of mixers.

However, Kogelnik et al. teach a mixing circuit/star coupler with characteristics similar to those of the mixing circuit disclosed by Arthurs et al., and Kogelnik et al. further teach a mixing circuit comprising at least a first plurality of mixers cross coupled with a second plurality of mixers (Figures 2, 3, 4, and 6 show various examples of mixing circuits comprising pluralities of smaller mixing circuits cross coupled together; column 2, lines 39-45; column 4, lines 1-5).

It would have been obvious to a person of ordinary skill in the art to include a first plurality of mixers cross coupled with a second plurality of mixers as taught by Kogelnik et al. in the system disclosed by Arthurs et al. in order to implement the mixing circuit already disclosed.

Regarding claim 16, Arthurs et al. disclose a router circuit (Figure 3) comprising:

an electrical-to-optical converter changing electrical inputs into optical signals;

an N x N mixing circuit (star coupler 22) coupled to the plurality of optical signals and generating composite signals comprising plurality of optical signals (column 4, lines 4-19).

a bandpass filter circuit comprising a first and a second optical bandpass filter (part of fixed wavelength receivers 61-1...N; column 5, lines 23-25) coupled to outputs of the mixing circuit,

an optical-to-electrical converter circuit (fixed wavelength receivers 61-1...N) coupled to the bandpass filter circuit for converting the first optical output to a first electrical output and the second optical output to a second electrical output.

Arthurs et al. do not specifically disclose that the N x N star coupler comprises first, second, third, and fourth mixing circuits.

However, Kogelnik et al. teach a mixing circuit/star coupler with characteristics similar to those of the mixing circuit disclosed by Arthurs et al. Kogelnik et al. further teach a mixing circuit, such as the 4 x 4 mixing circuit shown in Figure 2, comprising four smaller mixing circuits as follows:

a first mixing circuit 26 coupled to a first group of the plurality of optical signals, the first mixing circuit having a first output and a second output, the first output and second output each having a first composite signal comprising the first group of optical signals;

a second mixing circuit 30 coupled to a second group of the plurality of optical signals, the second mixing circuit having a third output and a fourth output, the third output and fourth output each having a second composite signal comprising the second group of optical signals;

a third mixing circuit 28 coupled to the first and third outputs, the third mixing circuit generating a third composite signal comprising the first composite signal and the second composite signal; and

a fourth mixing circuit 32 coupled to the second output and fourth output, the fourth mixing circuit generating a fourth composite signal comprising the first composite signal and the second composite signal.

Regarding claim 21 in particular, Kogelnik et al. further teach that the first mixing circuit and the second mixing circuit comprise a respective first star power splitter and a second star power splitter (column 2, lines 39-45).

Regarding claims 16 and 21, again, it would have been obvious to a person of ordinary skill in the art to include four mixing circuits as taught by Kogelnik et al. in the system disclosed by Arthurs et al. as a known way to implement the N x N mixing circuit already disclosed.

Regarding claim 17, Arthurs et al. disclose that the electrical-to-optical converter comprises a modulated tunable laser (column 3, lines 34-43).

Regarding claim 20, Arthurs et al. do not further specifically disclose that the optical-to-electrical converter comprises a photodiode, but photodiodes are well known in the art as commonly available devices for converting optical signals to electrical ones. It would have been obvious to a person of ordinary skill in the art to use photodiodes as the optical-to-electrical converter in the system described by Arthurs et al. in view of Kogelnik et al. simply in order to implement the disclosed conversion using widely known and available elements.

8. Claims 14 and 15 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs et al. in view of Kintis et al. (US 5,661,582 A).

Regarding claims 14 and 15, Arthurs et al. disclose a router as discussed above with regard to claim 1, and further disclose a buffer circuit 43 (shown in Figure 2) synchronizing the electrical input signals within a predetermined tolerance before the router (column 3, lines 16-43).

Arthurs et al. do not specifically disclose that the electrical inputs/signals comprise RF inputs/signals.

However, Kintis et al. teach a system related to the one disclosed by Arthurs et al. including optical switching means (Figures 1-3). They further teach using the optical switching means to process RF inputs from a satellite system that are converted to optical signals (column

2, lines 8-31). It would have been obvious to a person of ordinary skill in the art to incorporate RF signals such as taught by Kintis et al. as the electrical inputs in the system disclseod by Arthurs et al. in order to advantageously allow the RF signals to be switched in the optical domain as taught by Arthurs et al. instead of the electrical domain. Kintis et al. particularly teach that signals suffer losses in an electrical switching system and that it would especially disadvantageous for RF signals from satellites to have high losses since the price of amplifying in a satellite is high (column 1, lines 42-60).

9. Claim 9 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs et al. in view of Bailey et al. (US 6,470,036 B1).

Regarding claim 9, Arthurs et al. disclose a router circuit as discussed above with regard to claims 1 and 8 above, including tunable lasers 45-1...N, and further disclose that the lasers are coupled to a control circuit (control logic 53-N shown in Figure 2). They do not specifically disclose a temperature sensor.

Bailey et al. teach an implementation of a tunable laser (Figure 2) including a control circuit 65 like the one already disclosed by Arthurs et al., and Bailey et al. further teach a temperature sensor 50 coupled to the laser, wherein the control circuit 50 responds to the sensor (column 5 lines 53-67; column 6 lines 1-10).

It would have been obvious to a person of ordinary skill in the art to further include a temperature sensor as taught by Bailey et al. in the system disclosed by Arthurs et al. in order to ensure that the output wavelength of the disclosed tunable laser is stabilized against changes in temperature and thereby increase the reliability of the system.

10. Claim 18 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs et al. in view of Kogelnik et al. as applied to claims 16 and 17 above, and further in view of Bailey et al.

Regarding claim 18, Arthurs et al. in view of Kogelnik et al. describe a router circuit as discussed above with regard to claims 16 and 17, including tunable lasers 45-1...N disclosed by Arthurs et al., and Arthurs et al. further disclose that the lasers are coupled to a control circuit (control logic 53-N shown in Figure 2). However, neither Arthurs et al. nor Kogelnik et al specifically disclose or suggest a temperature sensor.

Again, Bailey et al. teach an implementation of a tunable laser (Figure 2) including a control circuit 65 like the one already disclosed by Arthurs et al., and Bailey et al. further teach a temperature sensor 50 coupled to the laser, wherein the control circuit 50 responds to the sensor (column 5 lines 53-67; column 6 lines 1-10).

It would have been obvious to a person of ordinary skill in the art to further include a temperature sensor as taught by Bailey et al. in the system described by Arthurs et al. in view of Kogelnik et al. in order to ensure that the output wavelength of the disclosed tunable laser is stabilized against changes in temperature and thereby increase the reliability of the system.

11. Claims 10 and 11 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs et al. in view of Nishihara (US 6,512,616 B1) and Davidson (US 6,239,892 B1).

Regarding claim 10, Arthurs et al. disclose a router circuit as discussed above with regard to claim 1, but they do not specifically disclose a clock circuit.

However, Nishihara teaches a system for optical communication including an optical switch 131 (Figure 1). Nishihara further teaches transmitting a clock signal with the data signals using a clock electrical-to-optical converter 103 and a clock optical-to-electrical converter 112'

(column 12, lines 3-34), wherein the clock signal is delayed to match the output data signals. Nishihara do not specifically teach an optical delay line, but Davidson further teach (see Figure 8) using an optical delay line 250 to delay an optical clock signal so that a clock signal is provided with a required amount of delay to remain synchronized with transmitted data signals (column 10, lines 6-29). Regarding claim 11 in particular, Davidson does not specifically teach that the delay line comprises an optical fiber, but it is well known in the art that optical delay lines may commonly comprise optical fiber.

Regarding claims 10 and 11, it would have been obvious to a person of ordinary skill in the art to include transmitting a clock signal with the data signals as taught by Nishihara and transmitting a clock signal through a delay line as further taught by Davidson in the system disclosed by Arthurs et al. in order to ensure that the data output from the router maintains synchronization. Further regarding claim 11 in particular, it would have been obvious to a person of ordinary skill in the art to specifically use optical fiber as the delay line taught by Davidson in order to implement the delay line using well known and commonly available elements.

12. Claims 23 and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs et al. in view of Nishihara (US 6,512,616 B1).

Regarding claims 23 and 24, as well as claim 24 may be understood with respect to 35 U.S.C. 112 discussed above, Arthurs et al. disclose method of operating a router circuit as discussed above with regard to claim 22, but they do not specifically disclose a clock signal.

However, Nishihara teaches a method for optical communication including an optical switch 131 (Figure 1). Nishihara further teaches synchronizing the output data signals with a clock signal (Abstract). Regarding claim 24 in particular, Nishihara teaches delaying the clock

signal to an amount corresponding to a delay of a cross-connect switch 131 to obtain a delayed clock signal (column 12, lines 3-34).

It would have been obvious to a person of ordinary skill in the art to include transmitting a delayed clock signal with the data signals as taught by Nishihara in the method disclosed by Arthurs et al. in order to ensure that the data output from the router maintains synchronization.

13. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Arthurs et al. in view of Kogelnik et al. as applied to claim 16 above, and further in view of Nishihara and Davidson.

Regarding claim 19, Arthurs et al. in view of Kogelnik et al. describe a router circuit as discussed above with regard to claim 16. However, neither Arthurs et al. nor Kogelnik et al specifically disclose or suggest a clock circuit.

However, again, Nishihara teaches a system for optical communication including an optical switch 131 (Figure 1). Nishihara further teaches transmitting a clock signal with the data signals using a clock electrical-to-optical converter 103 and a clock optical-to-electrical converter 112' (column 12, lines 3-34), wherein the clock signal is delayed to match the output data signals. Nishihara do not specifically teach an optical delay circuit, but Davidson further teach (see Figure 8) using an optical delay line 250 to delay an optical clock signal so that a clock signal is provided with a required amount of delay to remain synchronized with transmitted data signals (column 10, lines 6-29).

Regarding claim 19, it would have been obvious to a person of ordinary skill in the art to include transmitting a clock signal with the data signals as taught by Nishihara and transmitting a clock signal through a delay circuit as further taught by Davidson in the system described by

Arthurs et al. in view of Kogelnik et al. in order to ensure that the data output from the router maintains synchronization.

Conclusion

14. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Christina Y. Leung whose telephone number is 571-272-3023. The examiner can normally be reached on Monday to Friday, 6:30 to 3:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Jason Chan can be reached on 571-272-3022. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 571-272-2600.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

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